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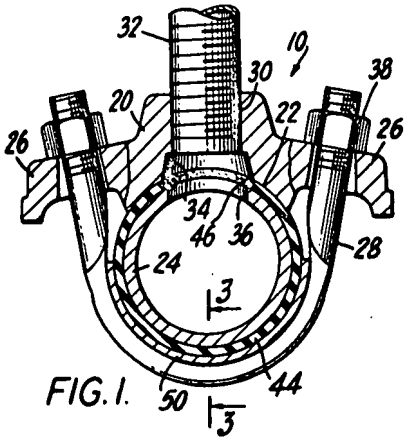


FIG. 1.

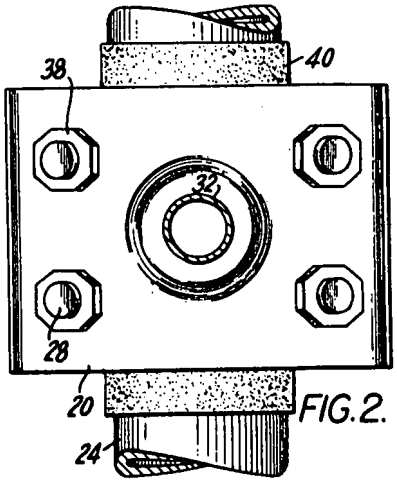


FIG. 2.

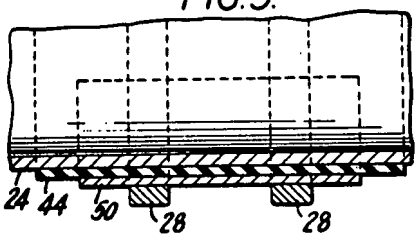


FIG. 3.

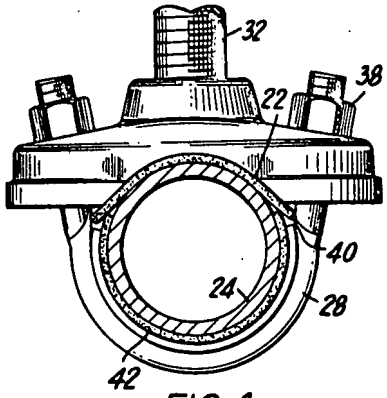


FIG. 4.

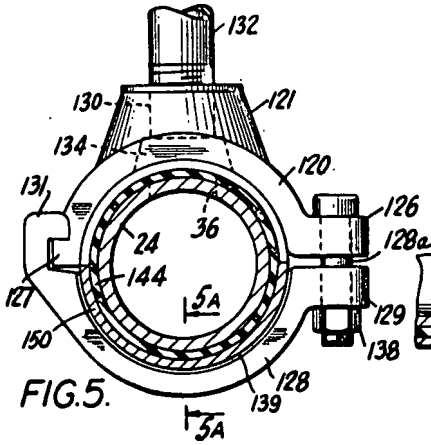


FIG. 5.

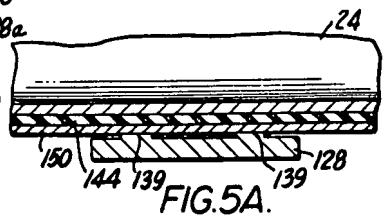


FIG. 5A.

FIG. 6.

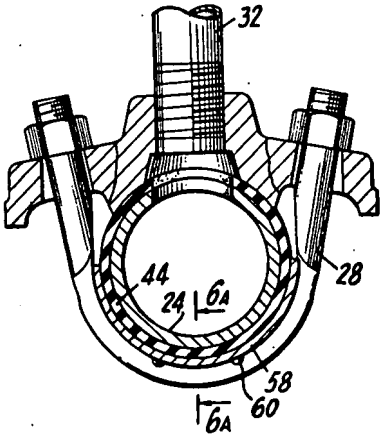


FIG. 6A.

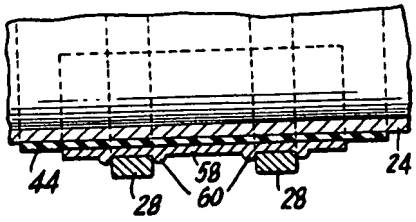


FIG. 7.

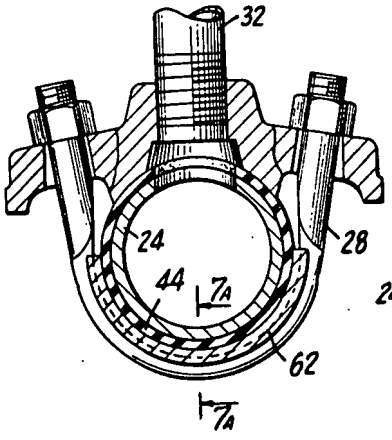
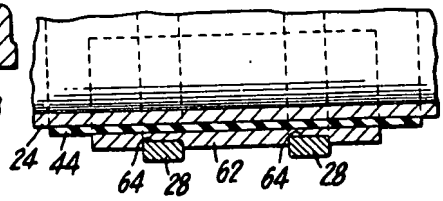


FIG. 7A.



This invention relates to pipe fittings and is more particularly concerned with a pipe saddle of the type employed to connect a branch pipe line to a main pipe line, as in the distribution of gas and like fluids.

In the installation and use of pipe lines for the distribution of gas, water, oil and the like, a fitting known as a "saddle" is commonly employed when it is desired to attach a branch pipe line of smaller diameter to a main pipe line, particularly when the differences between the diameters of the branch line and the main line are great. A saddle may be applied to the main line pipe either at the time the main line is being installed or it may be attached to an existing main pipe line to connect a new branch line to the existing main line and this type of fitting is, therefore, of general utility.

Saddles generally comprise a main body portion in the form of a block of metal having a curved inner face adapted to engage the side wall of the main line pipe section. The body portion is provided with a threaded aperture in which the branch line is received, and means are provided for drawing the body portion into fluid-tight engagement with the surface of the main line. Thus, stirrups or bails are commonly employed to surround the main line and to engage portions of the body to draw it against the line. Gaskets formed from lead, rubber, or like materials are used for insuring a fluid-tight seal between the main line pipe and the saddle in the area in which fluid-communicating relationship between the saddle and the pipe is established.

While saddles of various types have been extensively used and are generally effective for their intended purpose, the relatively rapid corrosion of such saddles in service has present-

ed a serious problem and has represented a significant maintenance expense. Such corrosion attack has been found to be almost entirely of electrical origin and to result from the passage into the branch line of electrical currents flowing along the main line, or vice versa. Since pipe lines with which saddles are commonly used are buried in the ground, they tend to pick up electrical currents which emanate from a variety of sources such as the tracks of electric railway systems, industrial power grounds, induced currents from parallel lines, chemical action of soils of different compositions along the route of the pipe line, galvanic action between different metals, e.g. the metal of the saddle and the metal of the main line pipe, and the like. Such currents are, therefore, an almost ever-present threat to the pipe line, and saddles are particularly receptive to such corrosion attack for the reason that they present a discontinuity of structural elements composed of projecting members and edges. The electrical currents set up an electrolytic reaction between the metal of the pipe and the soil surrounding it, and when the current is allowed to flow unrestrictedly through the saddle, this electrolytic action soon causes serious damage and failure of the saddle. Furthermore, not only the saddles are damaged by such electrolytic action but the adjacent portions of the main line pipe and the branch line pipe are attached as well. A major practical problem in the use of pipe saddles is, consequently, the adequate protection of these fittings from the destructive action of the electric currents encountered in service. It is of great practical importance to reduce to a minimum the need for repair or replacement of the saddles or other portions of the lines, since such maintenance is expensive and time consuming and necessitates costly interruptions in service.

It is often the practice to provide cathodic protection against corrosion to the service line leading from the main line into the building of the consumer. In such cases the present practice is to insulate between the street tee or street ell and the service pipe. Insulation at this point leaves the street tee and the saddle out of the cathodic protection system. This would not be particularly serious if the mains were provided with cathodic protection. However, in a great many cases, particularly when cast iron pipe is involved, there is no cathodic protection system connected to the main line. It has been thought that it is not necessary to protect cast iron pipe cathodically because of its greater thickness and because of the nature of the metal itself. However, the Institute of Gas Technology Report #2, Project PB-30 indicates that it has been found that corrosion is particularly severe on steel services connected to, but not insulated from, cast iron mains because cast iron is cathodic to steel. The same statement applies to the malleable iron saddle and the malleable iron street tee when the insulation is placed between the street tee and the steel service pipe and the saddle is not insulated from the main. In the above-mentioned report, it is also stated that the types of fittings with which a significant amount of leakage is experienced, include service saddles and it is stated that corrosion often results in serious damage to the service connection fittings at the main. In addition, it is stated that experience has shown that service saddle leaks also result from disturbance of the saddle gasket, such disturbance being caused by accidental displacement of the saddle with respect to the main line pipe upon which it is installed.

In pipe lines constructed with flexible compression

couplings, e.g. the well-known Dresser couplings, it has been proposed to impede the flow of electrical currents along the lines by the use of so-called insulating couplings. Such insulating couplings, however, do not solve the problem of corrosion attack of saddles and saddles are very commonly used in connection with pipe lines formed from pipe sections joined by conventional non-flexible, non-insulating couplings.

It is thus the principal object of this invention to provide an electrically-insulating pipe saddle of novel and improved construction.

It is another object of the invention to provide a saddle of the character indicated which effectively prevents the flow of electrical currents between the main line pipe and the branch line pipe to which it is joined, yet which is resistant to displacement.

It is a further object of the invention to provide an electrically-insulating pipe saddle which, when electrically connected to the service branch pipe, will utilize any existing cathodic protection system of the service line to protect the saddle and any associated street tee.

It is a still further object of the invention to provide an insulating saddle in which optimum electrical insulation is achieved and maintained even in the case of high pressure application.

According to the invention, an insulating pipe saddle is provided which comprises a body portion having a threaded aperture for receiving the branch line pipe and having an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, a secondary or clamping portion adapted, in conjunction with the body portion, to surround the main line

pipe and, by engagement with the body portion, to draw it against the surface of the pipe, insulating means adapted to be disposed between the body portion and the pipe and between the clamping portion and the pipe, and pressure distributing and compensating means interposed between the clamping portion and the insulating means. The insulating means in accordance with my invention are formed from an elastic, electrically-insulating material and may comprise a single continuous member or may be discontinuous and be formed from two or more separate members. In a preferred form of my invention, the clamping portion is in the form of bails or stirrups, and a clamping plate is provided for insuring effective engagement with the insulating means, and distribution of pressure to prevent injury thereto, even when high installation pressures are applied, and to insure against displacement of the saddle.

The effect of the pressure-distributing and compensating means is to distribute the pressure applied over a large area of the insulating sheet in the lower half of the main line pipe to make possible high total pressure but low unit pressure.

Other objects and features of the invention will be apparent from the following detailed description of illustrative embodiments of the insulating saddle and from the accompanying drawings, wherein,

Fig. 1 is an end elevational view, partly in section, of an insulating pipe saddle embodying features of the present invention;

Fig. 2 is a top plan view of the insulating saddle shown in Fig. 1;

Fig. 3 is a fragmentary sectional view of a portion of the insulating saddle shown in Figs. 1 and 2, as seen approximat-

ly along the line 3-3 of Fig. 1;

Fig. 4 is an end elevational view of a modified form of the saddle shown in Fig. 1;

Fig. 5 is an end elevational view of another form of saddle embodying features of the present invention;

Fig. 5A is a sectional view taken approximately along the line 5A-5A of Fig. 5;

Fig. 6 is an end elevational view, partly in section, of a saddle similar to that shown in Fig. 1, but illustrating another embodiment of the backing plate;

Fig. 6A is a sectional view taken approximately along the line 6A-6A of Fig. 6;

Fig. 7 is an elevational view similar to Fig. 6 but showing another embodiment of the backing plate; and

Fig. 7A is a sectional view taken approximately along the line 7A-7A of Fig. 7.

Referring to the drawings, and particularly to Figs. 1 to 4, the numeral 10 designates generally one illustrative embodiment of the insulating saddle of this invention. The saddle 10 comprises a body portion 20 which is suitably formed from steel, cast iron, or other metal. The body portion 20 has an inner arcuate face 22 having a curvature conforming substantially to that of the exterior surface of the main line pipe 24 upon which it is installed, and has wing portions 26 which are suitably apertured to receive the ends of the stirrups 28. The body 20 is provided with a central threaded aperture 30 in which is received the threaded end of a branch line pipe 32, the aperture 30 terminating in a slightly enlarged unthreaded recess 34 formed in the face 22. The recess 34 communicates with an aperture 36 in the pipe 24, which may be formed in the pipe before installation

of the saddle, but which is preferably formed after installation. The stirrups 28 are provided with nuts 38 which serve to draw the stirrups and the body portion 20 together around the main line pipe 24. The face 22 of the body portion 20 and the stirrups are suitably dimensioned to fit any of the sizes of the pipe produced commercially and used for the construction of gas lines and the like.

It is known that, in practice, pipes vary to some extent from what may be termed the "nominal" size, some being of slightly greater external diameter and others being of somewhat lesser external diameter, i.e. varying from what may be termed a "maximum" pipe to what may be termed "minimum pipe". The insulating pipe saddle of this invention is of a construction which adapts it to be used with equal effectiveness both with maximum pipe and with minimum pipe, as will be apparent as the description proceeds.

It is a feature of this invention that the saddle is electrically-insulated from the main line pipe in such a way that flow of electrical current through the saddle between the main pipe and the branch pipe is prevented. For this purpose there is provided at least one insulating sheet or web positioned between the face of the body portion and the main pipe surface and between the stirrups and the pipe surface. Referring to Fig. 4, an insulating sheet 40 is shown between the exterior surface of the main line pipe 24 and the arcuate face 22 of body portion 20 and a second insulating sheet 42 is shown between the pipe 24 and the stirrups 28 opposite the sheet 40. Whe two insulating sheets are employed they advantageously overlap as shown in Fig. 4 in order to provide complete coverage of the main line pipe area upon which the saddle is being installed. While Fig. 4 thus

shows the use of a two-unit insulating means, comprising two separate insulating sheets, the sheets 40 and 42 may be formed integrally, as shown in Fig. 1. Thus, the insulating sheet 44 shown in Fig. 1 may be in the form of a sheet of sufficient width to extend under the saddle and be split transversely, e.g. at the bottom of the main line pipe, to permit its application to the pipe 24, or it may be in the form of a long continuous strip adapted to be wound spirally around the pipe 24. The sheet 44 is provided with an aperture 46 positioned to coincide substantially with the aperture 36 in the pipe 24 and the recess 34 of the saddle body portion 20. A similar aperture (not shown) is formed in sheet 40. These apertures are suitable formed after the saddle has been applied, by means of a drill or other convenient tool. If the main line pipe is not already formed with an aperture, the aperture in the gasket sheet and the aperture in the main line pipe may be formed simultaneously.

The insulating sheets 40, 42 and 44 are formed from rubber or rubber composition, this term being used generically to include natural and synthetic rubbers and elastomeric compounds, or compositions having like properties and characteristics. The material is relatively firm and solid but sufficiently resilient and elastic to flow under pressure to conform to the surfaces between which it is confined. Preferably, the insulating sheets are formed from a rubbery composition which is relatively resistant to attack by hydrocarbon gases and oils. Examples of such resistant rubbery compositions suitable for use with the saddle are Neoprene (polychloroprene) and butadiene-acrylonitrile copolymers, such as those known commercially by the trade designations Buna-N or GR-A. The invention is, however, not limited to these specific materials, and particularly when special resistance

to gases and oils is not required, any rubbery composition having the above-noted characteristics may be employed.

To apply the insulating saddle of the type shown in Figs. 1 to 4 it is merely necessary to place the stirrups and the insulating sheet 42 or 44 around the main line pipe 24, to place the body portion, and the insulating sheet 40 in the case of the embodiment of Fig. 1, in position over the stirrups so that the free ends of the stirrups extend through the apertures in the wings 26 of the body portion, and then to tighten the nuts 38 to the desired degree upon the threaded ends of the stirrups. As previously indicated, the aperture 36 in the pipe 24 may be formed before the installation of the saddle or may be made after installation. In the latter case, after the saddle has been applied as just described, the drilling tool is inserted through the aperture 30 of the body 20 and the aperture 36 drilled. The branch line pipe 32 is then screwed into the threaded aperture 30 and the installation is complete. It will be observed that in the installed saddle metal-to-metal contact between the main line pipe 24 and all portions of the saddle is prevented by the insulating sheets 40,42 and 44. The opportunity for any galvanic action is thus eliminated and any current which may be flowing along the pipe 24 is prevented from passing to the saddle. It will also be observed that the insulating sheet 40 or 44 not only serves as an insulating member but also simultaneously serves as a fluid-tight sealing medium which prevents the escape of any of the gas or liquid flowing from the pipe 24 through the saddle into the branch line 32. When the saddle is applied, the sheet 40 or 44 is pressed into sealing engagement between the surface of pipe 24 and the face 22 of the saddle body 20. Being formed from a resilient, elastic material, the sheet 40 or 44 is conformed to

the surface between which it is compressed, whether maximum or minimum pipe is employed, and a fluid-tight seal is effected. The aperture 46 is preferably formed in the elastic sheet 40 or 44 before application or, as mentioned, it may be formed by the drilling tool simultaneously with the formation of the aperture 36 in main line pipe 24.

As previously discussed, the two spaced-apart stirrups of the type found in the embodiments shown in Figs. 1 to 4, tend to concentrate the compression forces upon the insulating sheet 42 or 44 along the lines directly under the stirrups. In accordance with this invention, means are provided for distributing the compression forces to the insulating sheet. This type of structure permits full insulation to be achieved and maintained, the life of the insulating sheet is prolonged and a firm, insulating installation can be obtained regardless of irregularities in the surface of the main line pipe and regardless of the amount of pressure maintained within the line.

Referring to Figs. 1 and 2, an arcuate plate 50, having a curvature conforming to that of the pipe 24, is disposed between the insulating sheet 44 and the stirrups 28. The latter are shaped to accommodate the plate 50 and yet have the appropriate curvature to correspond to that of the pipe 24. In the embodiment illustrated, the stirrups 28 have a reduced thickness and are flattened in the region of plate 50. When the nuts 38 are tightened, the pressure exerted by the stirrups will be transmitted to the plate 50 and will be distributed over a substantial surface of the insulating sheet 44. Thus, even when substantial pressure is applied, the insulating sheet will not be damaged, desired insulation will be realized and a firm achoring of the saddle upon the pipe will be achieved.

Instead of giving the pressure-distributing plate a smooth outer surface, as in the embodiment shown in Figs. 1 to 4, the plate is advantageously provided with means for seating the stirrups. Referring more particularly to Figs. 6 and 6A, positioned between the stirrups 28 and the insulating member 44 is an arcuate plate 58 formed with projections or bosses 60 which define channels in which the stirrups 28 are received. The bosses 60 serve to center the plate 58 with respect to the other parts of the saddle and also prevent displacement of the plate during use. Instead of bosses, grooves may be provided on the outer surface of the pressure distributing plate, suitably spaced to define stirrup-receiving channels. Thus, referring to Figs. 7 and 7A, there is shown a modified form of arcuate backing plate, designated by the numeral 62, formed with grooves 64 which serve to position the plate relatively to the stirrups.

In the embodiments of this invention which have been described above, the clamping portion of the insulating saddle has comprised a pair of stirrups or bails which are received in suitable apertures in the body portion of the saddle and are drawn toward the body portion by means of nuts. It will be apparent to those skilled in the art, however, that various modifications may be made in the structures described. One such modification is shown in Figs.5 and 5A.

In this embodiment the body portion and the clamping portion of the saddle are hingedly connected and an insulating element is used which completely surrounds the main line pipe. Thus, referring to Fig. 5, wherein parts corresponding to those shown in the previously-described embodiments have been given like reference numerals to which 100 has been added, the body portion 120 has a semi-cylindrical form and is provided with an apertured

flange 126 along one edge and a flange 127 along the opposite edge, the flange 127 having an inwardly sloping top surface. A projection 121 of substantially frusto-conical outline extends upwardly from the central portion of the body 120 and is formed with a threaded aperture 130 adapted to receive the branch line pipe 132. A recess 134 formed in the inner surface of the body 120 communicates with the aperture 130 and is adapted to be positioned over the aperture 36 in the main line pipe 24. Cooperating with the body portion 120 is a clamping portion 128, also of a semi-cylindrical outline, and provided with an apertured flange 129 along one edge and an L-shaped longitudinal projection 131 on the opposite edge. As shown in fig. 5, the projection 131 is shaped to engage the flange 127 of the body portion 120 and to make hinged engagement therewith when the flanges 126 and 129 of the body portion and clamping portion, respectively, are drawn together by the action of bolts 128a and nuts 138. Surrounding the pipe 24 and positioned between the surface of the pipe 24 and the body 120 and clamping portion 128 is an insulating element 144 and an arcuate plate 150. The element 144 may be in the form of a single sheet split transversely to permit ready application around the pipe, or it may be in the form of an elongated strip adapted to be wound in helical fashion around the pipe. The insulating element 144 is, of course, formed from the same type of rubbery composition employed in the formation of the previously-described insulating elements, e.g. the sheets 40, 42 and 44. In order to insure proper application of force when the nuts 138 are tightened, the member 128 is formed with circumferentially-extending ridges or ribs 139 corresponding in spacing to the stirrups 28. Consequently, the engagement of these ridges with the plate 150 corresponds to the engagement of the stirrups 28

with the plate 50 in the previously-described embodiments.

The insulating sheets 40, 42, 44 and 144 may be of varying widths, but they are preferably of a sufficient width that they extend somewhat beyond the ends of the metal portions of the saddle so that the conductive path through the soil between the saddle and the pipe is increased. In the case of underground pipe installations, it is recognized that the surrounding soil has a limited conductivity for electrical currents. By increasing the length of the path which the current must follow through the soil to pass between the main line pipe and the metal portions of the saddle, the effective quantity of current flowing along this path may be reduced to a negligible minimum. Thus, it is an additional feature of the insulating saddle of this invention that it may be formed not only to prevent direct metal-to-metal contact between the metal portions of the saddle and the main line pipe but also to prevent the flow between these elements of effective quantities of current through the surrounding soil.

The plate 50 may be of varying size in relation to the insulating sheet over which it lies but it advantageously extends longitudinally a distance which is greater than the outside diameter of the pipe in the case of pipe sizes up to and including 4 1/2 inches outside diameter, and greater than 1/2 the pipe outside diameter in the case of pipe sizes greater than 4 1/2 inches outside diameter.

While this invention has been fully described and illustrated with reference to the several embodiments thereof shown in the drawings, it will be obvious to those skilled in the art that various changes and modifications may be made in the structural embodiments of the invention without departing from the scope thereof as defined in the appended claims. Thus,

the plate which bears against the insulating sheet, e.g. the plate 30, may be directly connected to the stirrups, as by welding, or it may be integrally formed with the stirrups, e.g. as a single casting. It will further be understood that, insofar as they are not mutually incompatible, the various features and details of construction of the several embodiments shown and described are interchangeable with one another. It is intended therefore, that all matter contained in the foregoing description and in the drawings shall be interpreted as illustrative only and not as limitative of the invention.

The embodiment of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, plate means having an arcuate surface adpated to conform to the curvature of the main line pipe disposed against said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe.

2. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, plate means having an arcuate surface adapted to conform

to the curvature of the main line pipe disposed against said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe, said insulating means merging with said insulating sheet.

3. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe, said insulating means being integral with said insulating sheet.

4. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet

formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, said clamping means comprising a pair of U-shaped bolts, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said U-bolts, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe.

5. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, said clamping means comprising a pair of U-shaped bolts, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said U-bolts, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe, said insulating means merging with said insulating sheet.

6. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, said clamping means comprising a pair of U-shaped bolts, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said U-bolts, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe, said insulating means being integral with said insulating sheet.

7. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line

pipe, said clamping means being hingedly connected to said body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe.

8. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, plate means having an arcuate inner surface adapted to conform to the curvature of the main line pipe disposed against said clamping means, the outer surface of said plate having bosses for engagement with said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate and said main line pipe.

9. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and

an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, said clamping means comprising a pair of U-shaped bolts, plate means having an arcuate inner surface adpated to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, the outer surface of said plate having bosses defining channels for receiving said U-bolts, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate and said main line pipe.

10. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, plate means having an arcuate inner surface adapted to conform to the curvature of the main line pipe disposed against said clamping means, the outer surface of said plate having recesses for engage-

ment with said clamping means, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe.

11. An insulating pipe saddle adapted to provide an electrically non-conductive connection between a main line pipe and a branch line pipe comprising, in combination, a body portion having a threaded aperture for receiving the branch line pipe and an arcuate inner face adapted to conform to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed against the arcuate face of said body portion and arranged to separate said face from the surface of the main line pipe, clamping means having portions engageable with said body portion for drawing the body portion into fluid-tight engagement with the main line pipe, said clamping means comprising a pair of U-shaped bolts, plate means having an arcuate inner surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, the outer surface of said plate having recesses for receiving the U-bolts, and insulating means positioned against the arcuate surface of said plate whereby to prevent electrically-conductive contact between said plate means and said main line pipe.

12. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the

curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means encircling a portions of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against said clamping means, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe.

13. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means comprising a pair of U-bolts encircling a portion of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe.

14. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means comprising a pair of U-bolts encircling a portion of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, the outer surface of said plate having bosses defining channels for receiving said U-bolts, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe.

15. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means comprising a pair

of U-bolts encircling a portion of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, the outer surface of said plate having recesses for receiving the U-bolts, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe.

16. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means comprising a pair of U-bolts encircling a portion of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe, said insulating means merging with said insulating sheet.

17. In a pipe line including a main line pipe and a branch line pipe, an insulating pipe saddle providing an electrically insulating fluid-conductive connection between said main line pipe and said branch line pipe, said saddle comprising a body portion having a threaded aperture in which said branch line pipe is received and an arcuate inner face conforming to the curvature of the exterior surface of the main line pipe, an insulating sheet formed from a non-conductive, resilient material disposed between the arcuate face of said body portion and the surface of the main line pipe, clamping means comprising a pair of U-bolts encircling a portion of said main line pipe and having end portions engaged with the body portion, plate means having an arcuate surface adapted to conform to the curvature of the main line pipe disposed against the curved portion of said U-bolts, and insulating means disposed between the inner surface of said plate means and the main line pipe whereby to prevent electrically-conductive contact between said clamping means and said main line pipe, said insulating means being integral with said insulating sheet.

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CANADIAN PATENT

INSULATING PIPE SADDLE

Roger E. Risley, Bradford, Pennsylvania, U.S.A.

Granted to Dresser Industries, Inc., Dallas, Texas, U.S.A.

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